International Journal of Agricultural Science and Research (IJASR)
ISSN(P): 2250-0057; ISSN(E): 2321-0087
Vol. 7, Issue 2, Apr 2017, 235-238

EFFECT OF FOLIAR SPRAY OF ZINC SULPHATE AND GIBBERELLIC ACID ON YIELD AND ECONOMICS OF GUAVA [*Psidium guajava* (L.) CV. G-27

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ABSTRACT

A field experiment was conducted at University guava orchard, Rajmata Vijayaraje Scindia Krishi Vishwavidyalaya, Gwalior (M.P) during the year 2014-15. The experiment was laid out in Randomized Block Design with 16 treatments replicated three times in a well established of 10 years old orchard. The treatment comprised of three different concentrations of zinc sulphate (0.20 %, 0.30 % and 0.40 %) and gibberellic acid (30 ppm, 60 ppm and 90 ppm) along with control as water spray. The higher concentration of zinc sulphate 0.40% and gibberellic acid 90 ppm (T_{15}) spray enhanced the number of fruits per plant (814.36), weight of fruit (210.40 g), yield of fruit per plant (74.76 kg) and Higest benefit cost (B: C) ratio (1:3.85) were also calculated.

KEYWORDS: Foliar Spray, Gibberellic Acid, Guava, Gwalior-27 & Zinc Sulphate

Received: Jan 22, 2017; **Accepted**: Mar 04, 2017; **Published**: Mar 08, 2017; **Paper Id.**: IJASRAPR201732

Original Article

INTRODUCTION

Guava "Apple of tropics" is one of the most important fruits of India. It is very hardy and can be grown under adverse conditions. Yield and quality of fruit remains poor if it is not managed properly and thus needed to be taken care of. Major influence on plant growth, development, yield and quality is due to mineral nutrients and phytohormones (Yadav *et al.* 2011). Nitrogen is essential for plant growth, zinc for growth and development, boron for effective fruit set and potassium is necessary for photosynthetic activities and translocation of photosynthates influencing the quality attributes (Sharma *et al.*, 2005 and Pathak and Mitra, 2008). Plant growth regulators play important role in fruit set, fruit production, fruit weight and fruit size without causing any adverse effect in fruit quality. Among them, NAA induces more fruiting, promotes flowering, whereas, GA3 increases fruit retention. Ethrel a ripening hormone induces early and uniform ripening (Jensen *et al.*, 1975). It has been seen that different nutrients in association of plant growth regulators increase economic yield facilitating harvesting (Pandey *et al.*, 1988). It is therefore, necessary to standardize the most effective combination to increase yield of quality fruits in guava. The total area under guava cultivation and production of guava in India is about 2.68 lakh hectares and 36,67,900 MT, respectively. The productivity of guava in India is 13.7 MT/ha. The total area and production of guava in Madhya Pradesh is 22,500 hectares and 8.41 Lakh MT, respectively. Madhya Pradesh ranks first in productivity with 37.6 MT/ha. Guava shares 4.5 per cent of area and 3.3 per cent of production among fruit crops in India. Gwalior is an important region in Madhya Pradesh, where guava is widely grown and several guava orchards are found in and around the Gwalior district. However, growth and productivity of the guava tree is influenced by a large number of factors. One of the important factors is inadequate supply of plant nutrients.

MATERIALS AND METHODS

The experiment was conducted at Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya, Gwalior (M.P.). Department of Horticulture (Fruit Science) during 2014-2015**.** The experiment comprised of 16 treatments in all *viz* three concentration of each of zinc sulphate (0.20, 0.30 and 0.40%) and gibberellic acid (30, 60, 90 ppm) and their combination along with a control under a Randomized Block Design (RBD) taking one plant as unit with three replications. The experimental material consisted of 10 years old uniform guava trees of cultivar "G-27" spaced at 6 x 6 m distance. Foliar applications of the treatments were done twice. First spray was done during 1st fortnight of august and 2nd spray was done 1 month after the 1st spray. The fruits were harvested when they are fully matured and parameters like, yield and economics were observed and analyzed statistically. The required quantity of zinc sulphate mixture was prepared by directly mixing required quantity of zinc sulphate in water and solution used for spraying immediately after preparation. The stock solution of gibberellic acid was prepared by dissolving 1g of gibberellic acid in 50 ml of alcohol and added distilled water to make volume of 1 lit. Zinc sulphate and gibberellic acid were sprayed on leaves on both the side using foot sprayer. Precautions were taken to avoid the drizzling of the on the other treatment. Observations were recorded by frequent intervals.

RESULTS AND DISCUSSIONS

In the present investigation, the results revealed that all the treatment of zinc sulphate and gibberellic acid significantly increase the number of fruits per plant (814.36) as compared to control (Table 1), however, the highest number of fruits per plant was achieved, with the application of 0.40% zinc sulphate + 90 ppm gibberellic acid (814.36) followed by treatment of 0.30% zinc sulphate + 90 ppm gibberellic acid in decreasing order. The maximum fruit weight (210.40 g) was recorded under treatment 0.40% zinc sulphate + 90 ppm gibberellic acid while, the minimum fruit weight (150.30 g) noticed under control. This might be due to role of zinc sulphate increase fruit weight attributed to the strengthening of middle lamella and consequently cell wall, which later may have increase the free passage of solutes to the fruits. Sharma *et al*, (1991) recorded maximum fruit weight with zinc sulphate (0.6%) in guava. Biswas *et al*, (1988) reported that the increased fruit weight following gibberellic acid application might be due to greater size of fruit and certain changes in metabolism of fruit which reflected in more accumulation of water and enhanced deposition of soluble solids. The maximum yield of fruit per plant (74.76 kg) was recorded under 0.40% zinc sulphate + 90 ppm gibberellic acid followed by 0.30% zinc sulphate + 90 ppm gibberellic acid while, the minimum yield of fruit per plant (35.41 kg) noticed under control. These results are similar to the findings of Katiyar *et al*. (2009) and EI-Sherif *et al.* (2000) also reported that fruit set percentages were increased by zinc spray resulting increase yield of fruit per plant. Wright (1956) suggested that primitive effect of growth substances in greater retention of fruit may be attributed to reduction in fruit drop. He also suggested that there is a correlation between fruit drop and endogenous hormonal status, and existence of high level of internal auxin that prevent fruit drop.

Table 1: Effect of Zinc Sulphate and Gibberellic Acid Sprays on Guava

Treatment			Number of Fruits per plant	Weight of Fruit (g)	Yield of Fruit per plant (kg)
	Zinc Sulphate (%)	Gibberellic Acid (ppm)			
T0	0	0	414.41	150.30	35.41
T1	0.2	0	524.58	161.29	44.08
T2	0.3	0	550.73	169.23	46.17
T3	0.3	0	575.67	172.09	48.11
T4	0	30	603.88	175.07	50.33
T5	0.2	30	616.52	176.97	52.08
T6	0.3	30	649.11	180.05	54.17
T7	0.4	30	676.93	183.01	56.33
T8	0	60	693.92	185.15	58.28
T9	0.2	60	717.07	187.67	61.31
T10	0.3	60	737.44	190.27	63.22
T11	0.4	60	759.15	194.77	65.69
T12	0	90	766.08	197.66	67.11
T13	0.2	90	781.74	201.74	69.07
T14	0.3	90	796.00	208.03	71.41
T15	0.4	90	814.36	210.40	74.76
CD at 5%			9.472	0.597	0.211
C.V.%			1.70	0.39	0.44

Table 2: Economics of Zinc Sulphate and Gibberellic Acid Sprays on Guava

Treatment		Common Expenditure Pre Per (Ha) (A)	Total Expenditure Per Ha (B)	Extra Cost (C) (B-A)	Gross Income Per Ha (D)	Net Income Per Ha (E) (D-A)	C:B Ratio (F) (D/B)
T_0	Zn0 G0	25000	25000	0	70826.67	45826.67	1:1.83
T_1	Zn1 G0	25000	27155	2155	88160.00	61005.00	1:2.25
T_2	Zn2 G0	25000	27727	2727	92346.67	64619.67	1:2.33
T_3	Zn3 G0	25000	28830	3830	96220.00	67390.00	1:2.34
T_4	Zn0 G1	25000	26923	1923	100653.33	73730.33	1:2.74
T_5	Zn1 G1	25000	30621	5621	104160.00	73539.00	1:2.40
T_6	Zn2 G1	25000	30001	5001	108340.00	78339.00	1:2.61
T_7	Zn3 G1	25000	28600	3600	112666.67	84066.67	1:2.94
T_8	Zn0 G2	25000	27120	2120	116566.67	89446.67	1:3.30
T_9	Zn1 G2	25000	30100	5100	122626.67	92526.67	1:3.07
T_{10}	Zn2 G2	25000	30801	5801	126446.67	95645.67	1:3.11
T_{11}	Zn3 G2	25000	30675	5675	131373.33	100698.33	1:3.28
T_{12}	Zn0 G3	25000	28606	3606	134213.33	105607.33	1:3.69
T_{13}	Zn1 G3	25000	30131	5131	138146.67	108015.67	1:3.58
T_{14}	Zn2 G3	25000	30540	5540	142826.67	112286.67	1:3.68
T_{15}	Zn3 G3	25000	30850	5850	149513.33	118663.33	1:3.85

Economics is the major consideration for the farmers while taking a decision regarding the adoption of a new technology, hence the cost of cultivation, gross income, net income and benefit cost (B:C) ratio were computed for different treatments.

The economics (Table 2.) of guava production under the influence of different treatment of chemicals (zinc sulphate and gibberellic acid) application showed a great variation in cost of production, gross income, net income and benefit: cost ratio as compared to control. The maximum net return (118663.33/ha) and (B: C) ratio (1:3.85) was

recorded with the application of 0.40% zinc sulphate + 90 ppm gibberellic acid followed by treatment of 0.30% zinc sulphate + 90 ppm gibberellic acid.

CONCLUSIONS

The results of present experiment for the 10 years old guava cv. G-27 shows that the higher dose of zinc sulphate (0.40%) and gibberellic acid (90 ppm) treatment has been most appropriate under agro-climatic conditions of Gwalior region for obtaining maximum yield and economics of guava.

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